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The Pennsylvania State College Correspondence Courses in Nature Study

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Insect Life

LESSON NO. 3

THE CABBAGE BUTTERFLY

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WE have studied the house-fly and the honey-bee, and while these are both *insects*, we have found vast differences in their structure and habits. We now consider another insect which is very different from either of the two mentioned. No doubt every child knows what a butterfly is, without being able to give a definition or description that would distinguish it from other insects *resembling* a butterfly.

The insects most closely related to the true butterflies, and often considered with them, are those known as *moths*, or what the children frequently call "millers." Let us notice the differences between these two classes of insects. Butterflies fly by day. They delight in sunshine, and when resting they fold their wings together in a vertical position. Their antennæ, or "feelers," projecting from the head, are thread-like, with a club at the tip. The abdomen is slender. On the other hand, the moths fly mostly by night and are attracted by lights. When at rest their wings lie horizontally or folded closely over the body. The antennæ are usually feather-like or thread-like, without the club tips, and the abdomen is usually large. The wings of butterflies are very unlike those of the house-fly or honey-bee. The wings of these insects, we may have observed, are clear membranes whereas in the case of butterflies they are covered with

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overlapping scales, after the manner of shingles on a roof. These scales possess the color of the wings, just as do the feathers on a bird or the hairs of a dog or horse. When we catch the moth or butterfly, we often find our fingers covered with a mealy substance or dust, which is nothing but a lot of these scales rubbed from the wings. In the butterfly, moreover, we have a third style of *insect mouth.* You will remember in the house-fly that it was a lapping proboscis; in the bee there were chewing mouth-parts moving laterally. We see in the butterfly a very strange sort of mouth. It looks like a black watch-spring which is concealed by two bunches of hairs projecting from the head. If you put a pin through the center of the coil, you can draw the mouth out and observe its length. In some of the larger butterflies it is an inch or two inches in length. As the food of butterflies is the nectar of flowers and must be obtained from the base of long, slender, tubular flowers, a long, slender proboscis is provided. Through this the liquid nectar is drawn up, and speedily the mouth is coiled away as the butterfly again resumes its flight.

The cabbage butterfly — the subject of our present study — is regarded as the most common of all butterflies, although it has only been a resident of this country for a few years. It is said to have been imported from Europe — unintentionally, of course — about the year 1857, and now has extended over about the entire area of the United States and Canada. It is regarded as the most injurious to agriculture of all our butterflies. From early spring to late fall — that is, from the first of April until the last of October — we may see this butterfly in country or city. I have witnessed it out on the ocean fully a mile from land, and have wondered where it would rest from flight.

Children wage desperate war against these "white wings," pursuing them across meadows, through parks, and about the streets. Perhaps the first real chase experienced by the young child is in pursuit of these ever-moving white butterflies. It might seem to some of our readers that the life of the butterfly in its mature or imago stage is quite long, on account of its continuous appearance during the summer. The fact is, however, that the individual does not live much more than three weeks, at which time it is succeeded by the members of another brood.

The cabbage butterfly measures two inches across the wings when fully extended. These wings are dull white in color, sometimes tinged with yellow, especially in the females. There are two pairs of wings. The tips of the fore-wings are black, and in the female there are two black spots on each fore-wing, in the male only one black spot, located about the center or near the center of the wing. This is an easy distinguishing mark of the sexes in this butterfly. There is also a black spot on the forward edge of each of the second pair of wings.

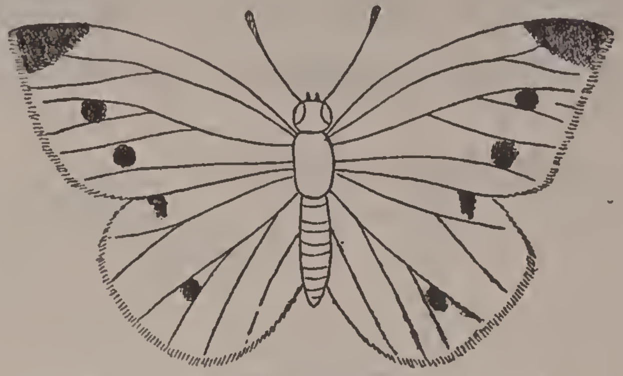

Fig. 6. Cabbage Butterfly—female.
Natural size.

Having observed the whereabouts of these butterflies, and knowing that their food is gathered from flowers without destroying the blossoms, it perhaps is not clear why this insect should be looked upon as the most injurious to the farmer or to the gardener, but we must know more of its life history before the reason is clear to us.

The fact was mentioned in former lessons that insects have usually four distinct stages in their life, and appear very different in each of them. These four stages, you will recall, are: the egg, the larva, the pupa, and the imago or adult. These four stages are very well marked in the case of the insect we are studying, and it is possible, by a little careful search, for anyone to collect all four of these stages during the summer months. The eggs are small, yellow, elliptical bodies, which are laid on any suitable plants, as old cabbage stumps, wild radish, mustard and cress, early in the season. Later on we may find them upon the young cabbage plants, where the best food for the subsequent larvæ may be directly obtained. The eggs are deposited singly, or in twos or threes, on the outer surface of leaves. They stand upright upon the leaf. Each female butterfly lays from 100 to 300 eggs in the course of its existence, which, as already indicated, is about three weeks.

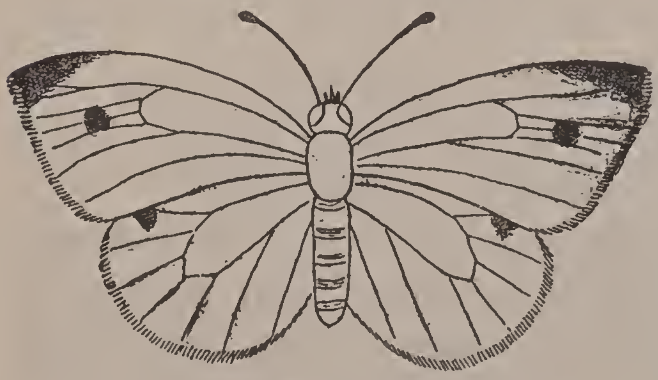

Fig. 7. Cabbage Butterfly—male.
Natural size.

In from five to ten days after the eggs are laid, depending upon the difference in the atmosphere, the eggs are hatched and a small green larva, or caterpillar—which is the common name for the larvæ of butterflies—appears. This caterpillar is almost uniformly green, even the eyes being that color, but by close observation we may distinguish three narrow, lemon-yellow stripes running the full length of the body, one on the back and one on either side of the body. These two lateral ones are not continuous but interrupted at each segment of the body.

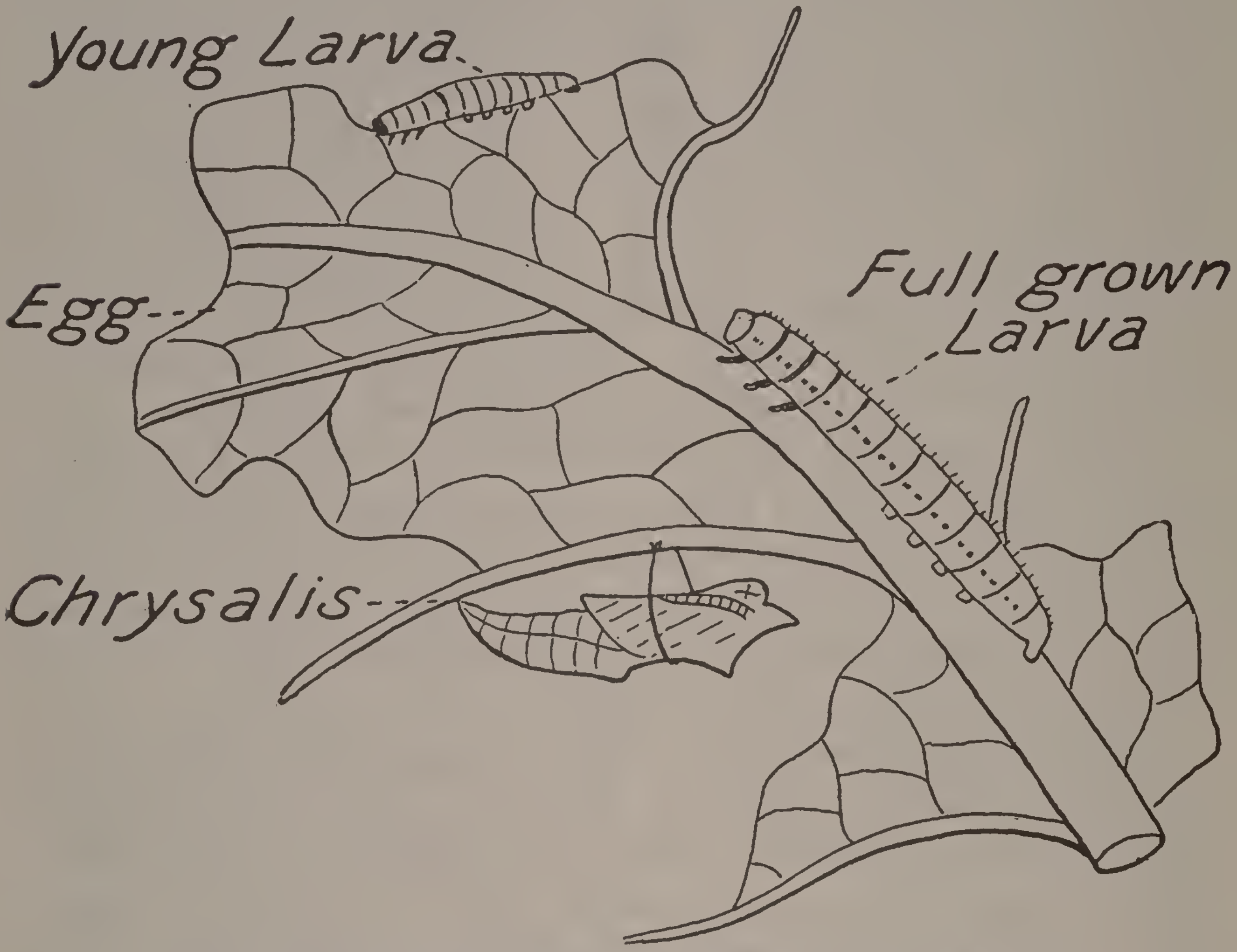

Fig. 8. Egg, larvæ and pupa of Cabbage Worm. Natural size.

This caterpillar is often called the "cabbage worm," and is clothed with a coat of velvety green hairs, which makes it very beautiful when magnified under a hand-glass.

When first hatched, the caterpillars are less than a fourth of an inch in length, but by feeding rapidly they increase in size and are full grown in about two weeks, when they measure about one inch in length.

We will see on the under side of the caterpillar a great many legs, and by close inspection we will find that there are two kinds of legs. Three pairs just back of the head are rather slender and jointed. These are known as the *true legs* of the larva. Then we will observe ten more legs on the breast of the body. Now let us notice that the body of the caterpillar is marked by constrictions, or rings, making twelve sections. The three pairs of true legs are attached to the three consecutive sections just back of the head. The next two sections are without legs. Then come four sections, each having a pair of very clumsy, fleshy, short legs, looking like mere protrusions from the body. If we have a hand-glass we may see at the end of these fat legs many short hooks, by means of which the caterpillar holds itself firmly to the plants upon which it feeds. Passing backward, we meet again two sections of the body without legs; and lastly, the final section bears another pair of these fat legs. These five pairs of legs are known as false legs, because they are possessed by this insect only during the larval stage. The three pairs of jointed legs near the head are the ones which are perpetuated in the butterfly that is developed from the larva.

These caterpillars devour their food very rapidly for twelve days, then they creep away to some secluded place to change into the chrysalis or pupa stage. It is remarkable to notice here that the food of this butterfly consists almost exclusively of the plants of a certain family, known as Cruciferæ, which we may call the cabbage family of plants. To this belong the cabbage, cauliflower, radish, mustard and cress. Late in the season, however, the caterpillars have been known to feed upon mignonette and nasturtium.

After the caterpillar has ceased eating, it loses its bright green color and seeks some secluded place to pupate. This may be upon old cabbage leaves or stalks, on fences or rubbish, or, as frequently observed, on the outer walls of unpainted buildings. When a suitable place is found, the caterpillar spins from its mouth a silken thread, which is fastened to the surface chosen, and covers it entirely with a network of fibers, making a thin, hard cloth. Soon a small elevation of fibers is formed upon this cloth and the larva hooks itself to this by its hindmost pair of feet. This done, the caterpillar turns its head back upon itself to about the middle of its body and there fastens a thread fast upon one side, then on the other, passing over the body at about the sixth section. This thread is strengthened by many fibers carried over and over, and the insect is held securely in place. When the sleeping pupa is formed it cannot drop from its perch. In about thirty hours more the transformation from the larva to the pupa will be complete, and instead of an active caterpillar there will be a green, stiff, angular chrysalis occupying the place. The operation seems to be a great struggle for the animal, for the skin must be burst open by an internal effort of the larva. It writhes and twists and turns, this way and that, until it enlarges its diameter just back of the head enough to split the skin on the back. By patiently watching this operation, we may see a very interesting struggle. The process becomes more simple when the first breaking of the skin has been accomplished. The chrysalis is forming rapidly. The head is withdrawn from its mask and the six jointed legs are pulled out of their larval coverings. The skin, as it dries, moves backward. This is hastened also by the wriggling of the insect until it has gone to the last segments of the body.

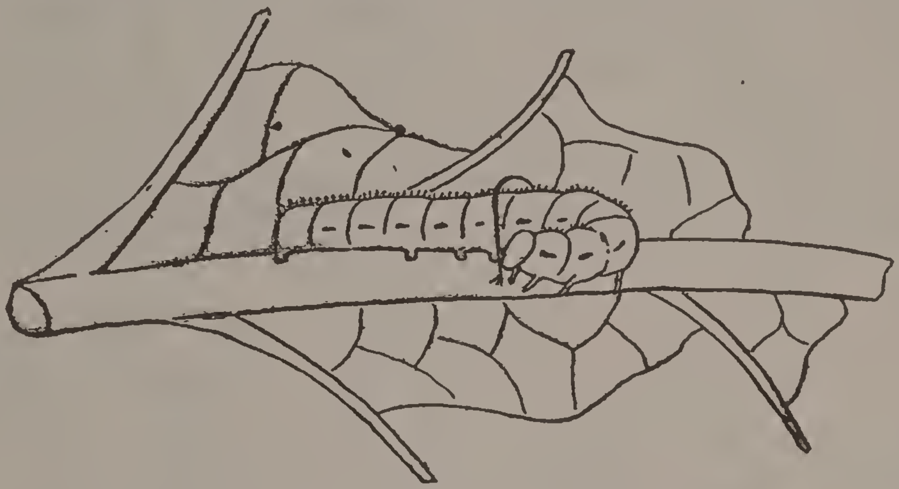

Fig. 9. Making the loop—preparing to pupate.

A difficult feat yet to be performed is that of casting the old skin by removing it from its fastenings in the silken mound. In its stead the tail end of the chrysalis must be attached. This is done by grasping the shriveled skin in the folds of the rear segments of the chrysalis, then withdrawing the last segment from its covering and breaking loose the old hooks, which were fastened into the silken threads, and grasping with the new hooks, the old skin is released and drops to the ground. In this position the insect remains for about two weeks, when, by a similar struggle, the chrysalis shell is broken, and a new white butterfly comes out. If, however, the pupation takes place late in the fall, the insect passes the winter in the pupa stage, a butterfly emerging from it in early spring.

As has been said, this insect is the most injurious to agriculture of all butterflies. It has become so widespread and so abundant that many cabbage crops are entirely ruined by it. The extensive market gardens about New York city have been very much infested by these insects, and immense losses have been sustained due to their ravages. It is possible, however, to protect this crop by the application of proper materials to kill the young larvæ as soon as they appear upon the plants.

This insect has many natural enemies among birds and among other insects. You may frequently have seen certain birds darting through the air, catching up the white butterflies and carrying them off. Another common sight also is that of certain sparrows in the cabbage fields early in the morning picking off the green worms. Certain insects known as parasites attack the bodies of the caterpillars and destroy the life within them in maintaining their own existence. The caterpillars are often destroyed also by a bacterial disease; nevertheless, farmers and gardeners cannot depend upon such agencies to protect their crops.

Many remedies have been tried from time to time, of which the following are most frequently recommended:

Hot water at 130° Fahrenheit, sprinkled upon the green worms, will kill the young larvæ without injuring the cabbage plants. This treatment, however, is not always convenient.

Kerosene, diluted with soapy water, when sprayed upon the larvæ, is a more satisfactory insecticide, killing the young worms very quickly without injuring the plants.

Instead of kerosene, Paris green, or some other arsenical poison, when sufficiently diluted, is sprinkled upon the young plants. Such material should not be used upon plants which are heading, on account of the likelihood of the poison being carried to the kitchen. The older plants may be safely treated with hellebore or pyrethrum (the latter known also as insect powder), diluting the fresh powders with six or eight parts of a cheap flour, mixing them thoroughly and dusting over the plants or by stirring one ounce of the powder in four or five gallons of water and applying in the form of a spray. These materials are sufficiently poisonous to kill the insects, but upon exposure to the air lose their poisonous character very quickly, so that no harm need be feared from the use of cabbage thus treated.

SUGGESTIONS TO THE TEACHER

Make sure that every pupil knows what the cabbage butterfly is, before much is said about it, to center the thought upon the right insect.

Make the drawings upon the blackboard large, with but few lines, and point out how much smaller the insect is than the drawing.

If you have secured a specimen of the butterfly, have the older pupils draw upon paper such parts as they can plainly distinguish.

If you have the green larva, observe how it walks, or eats, or acts, when disturbed.

Ask the pupils to watch the butterfly some day in flight, to see how high it goes, how rapidly it moves, and how long it can remain on the wing.

Compare the mouth of the larva with that of the butterfly.

Have some work of this character done outside of school hours by pupils who have the opportunity and zeal.

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